TELEPHONE NETWORK-BASED METHOD AND SYSTEM FOR AUTOMATIC INSERTION OF ENHANCED PERSONAL ADDRESS BOOK CONTACT DATA

FIELD OF THE INVENTION

The present invention relates generally to Telephone User Interfaces, and specifically to Personal Address Book applications that enable adding contacts for usage with enhanced automatic speech recognition via a telephone.

BACKGROUND OF THE INVENTION

Telephone answering (TA) applications currently use Automatic Speech Recognition (ASR) features, which enable a user to add contacts to a Personal Address Book (PAB) system via a telephone. One problem is that when a user adds a name from the telephone, he cannot assure the accuracy of the spelling of the name, because of the inaccuracy of the ASR application feature of the PAB system for alphabetic interpretation. For example, the user may receive a voicemail message from Joe Phillips, who may be previously unidentified to the user, and who leaves a message requesting a callback (the telephone number was received from a PBX, for example, and saved in addition to the message itself). The user accesses his PAB, and initiates the addition of the new contact based on his speaking both the contact's name and the telephone number that was left as part of the message. For example, Phillips sounds the same as Philips, Fillips and Filips, and therefore the ASR may spell the name incorrectly.

Even a "smart" system may do no better than "guess" at Phillips, the most common member of the homonym group.

A user is typically a subscriber of a service that is available via the telephone. This service typically includes an ASR recognizer and a PAB, and provides for the addition of contacts to the PAB directly over telephone. When the user elects to add a new contact using the telephone he:

- speaks the contact's name one or more times; and
- enters at least one telephone number to be associated with the name. The number can be added verbally by the user directly, or by Dual Tone Multi Frequency (DTMF) keypad entry or from the data saved with the message (as

received from the PBX) or the number can be added later from the Internet or some other device.

There are two shortcomings for the above process:

- the ASR recognition that results from matching with an alphabetic representation of a name can be better than that of contacts added directly from the verbal input; and
- by using a directory, e.g. a white pages, the PAB entry can be expanded with a growing variety of useful information (e.g. name spelling, address, e-mail, other telephone numbers, SMS, etc.).

The telephone number that was added in one of the ways described earlier may not be unique to an individual, since there can be many people sharing this telephone number, e.g. a family or a company with one telephone number.

Where no name is provided, only a telephone number, current TA applications can use a directory, such as a white pages directory, based only on the telephone number that was entered. If the telephone number is found in the directory white pages, the application can insert the spelled version of the associated name into the PAB or present it to the user to approve. If many people share a number, there is no provision for differentiation between their names, and worse yet, the spelled name might not fit the contact. Where the number is for a corporation, for example, the spelled name might be that of the company as opposed to being that of the contact (the subscriber wants to have the contact's name, although it is a company telephone).

There is, therefore, a need for a PAB application that helps the user verify that the added information from an external source (e.g. a white or yellow pages) matches his contact.

SUMMARY OF THE INVENTION

Accordingly, it is a principal object of the present invention to overcome the limitations of existing telephone answering (TA) systems, having Personal Address Book (PAB) applications using automatic speech recognition (ASR), and provide improved methods and a system for correctly updating these PAB's.

It is another object of the present invention to help subscribers automatically

add data to their PAB's, knowing that the automatically added data matches the contact's name as well as his telephone number.

In accordance with a preferred embodiment of the invention, there is provided a telephone network-based system for automatic insertion of enhanced contact data in a personal address book associated with a user, wherein the user has access to an electronic communications network. The system comprising:

a first application unit to host a telephone network-based system;

a second application unit programmed to present the user with contact data obtained via the electronic network, thereby assisting the user in selecting at least a portion of said contact data for entry into the personal address book, the second application unit comprising:

a voice response unit to route a user-initiated call into the system, to the second application unit;

a recognition server comprising an automatic speech recognizer for converting to text form a verbalized form of at least one new contact name forming part of the user-initiated call;

a storage unit, which stores at least one textual directory for loading into the recognition server;

a comparison unit for comparing the converted text form with a text entry in the at least one textual directory; and

a textual directory unit for searching the electronic network to locate the contact data based on the converted text form of said new contact name, such that the selected contact data is inserted in the personal address book associated with the user.

In an exemplary embodiment, a telephone network-based system coordinates and optimizes the use of a PAB in conjunction with an ASR, to help identify a new contact leaving a voicemail message, and to add this contact as a new PAB entry, along with additional useful contact information, such as mailing address, e-mail address, alternate telephone numbers and other relevant information. If necessary, where a plurality of similar-sounding names exist, the inventive system helps determine which of these is correct.

While adding this information to the PAB entry, the application provides assistance to the user during an interactive session involving both a telephone

interface and a Web interface. In the process of adding the contact information the user "trains" the ASR recognizer to associate the verbalized name with the contact record.

The addition of the contact information is achieved by a matching process, which uses the ASR capability of the system in the following way:

- while adding the contact, the user trains the system with his voice, and the voice is recorded;
- uses the telephone number to search external sources for matching entries that can be used for augmenting the data;
- after data is augmented from the external source, e.g. the WEB, white pages or a corporate directory, the spelling of the found names is fed into the ASR as the words that the ASR should search for;
- the system plays the recorded voice to the recognizer and commands it to recognize the name; and
- if the ASR finds a match between the recorded name and one of the names gathered from the external source, a positive match is declared.

The invention assures that the augmented data from any external address book (AB) matches the name of the contact spoken by the subscriber. Matching the spoken name to the textual name found in the external AB, by using ASR technology, is the mechanism by which this assurance is provided.

The inventive system enables the user to easily add a new PAB entry, and to automatically supplement the entry with additional contact data associated with the contact, with the knowledge that the added data also "belongs" to the contact.

For a better understanding of the invention with regard to the embodiments thereof, reference is made to the accompanying drawings, in which like numerals designate corresponding elements or sections throughout, and in which:

Fig. 1 is a schematic illustration of a telephone network-based system for new contact insertion in a PAB, in conjunction with a Web interface, in accordance with an exemplary embodiment of the present invention.

Fig. 2A is a schematic illustration of the telephone network-based system for

new contact insertion in a PAB of fig. 1, wherein the APU, RSU and VRU functions are distributed over more than one site, in accordance with an exemplary embodiment of the present invention.

Fig. 2B is a schematic illustration of the telephone network-based system for new contact insertion in a PAB of fig. 1, wherein the APU, RSU and VRU functions are distributed over more than one site and for one site they are located within the DMZ, in accordance with an exemplary embodiment of the present invention.

Fig. 3 is a flow chart of the PAB contact addition process for a subscriber accessing the system, in accordance with an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference is now made to Fig. 1, which is a schematic illustration of a telephone network-based system for new contact insertion in a PAB, in conjunction with a Web interface, in accordance with an exemplary embodiment of the present invention. The system enables the user to operate with the voice-based technology of a telephone network, and the text-based technology of the Web, to achieve the inventive objects of automatic insertion of contact data into a PAB, in an enhanced fashion.

The system **80** involves two main types of interaction with the subscriber, i.e., a telephone network interface **55** and an Internet or Web interface **116**, which may also be in the form of an organizational Intranet interface, such as IBM's global virtual machine (VM) network. The following acronyms associated with an exemplary embodiment now apply:

AB	Address Book
APU	Application Unit
GAB	Global Address Book
PAB	Personal Address Book
PSU	Persistence Storage Unit
RSU	Recognition Server
UI	User Interface
VoIP	Voice over Internet Protocol
VRU	Voice Response Unit

The connection to Internet/Intranet **116** can optionally include a Firewall **114**. In this case the LAN system is divided into three zones: a LAN secured zone **75**, a LAN Demilitarized Zone (DMZ) **85** and an Internet Zone **95**.

DMZ is a military term referring to an area between two opponents, where fighting is prevented. In a networking context, a DMZ refers to a network added between a protected network and an external network in order to provide an additional layer of security. However, when a business actually does want someone on the Internet to be able to access one of its servers, such as its Web server, an option is to place the server in question in a neutral zone between the private network and the Internet. Technically, the server is placed on a separate portion (subnet) of the local network, and then non-authenticated access is permitted to that specific portion. Such a separate portion of the local network is referred to as the De-Militarized Zone, or DMZ.

DMZ **85** becomes an inserted neutral communication zone. Basically, DMZ **85** is open to most Internet users that can benefit from a company's offerings, its Web documents, etc. Firewall (FW) **114** can, however, prevent users from crossing into DMZ **85**. FW **114** allows no connections to be made directly from Internet zone **95** to secured zone **75**. The road is simply blocked by the firewall **114**. However, Web application server **50** located in DMZ **85**, when serving a request from Internet **116**, can access the data and Web application servers **50** in secured zone **75**.

The types of subscriber interfaces are now described:

i. A telephone Network – this connection is established by a voice response unit (VRU) **110,** by connecting to a telephone network **55**. The connectivity can be via European telephony trunks E1, or non-European telephony trunks T1, Voice over IP (VoIP) connection type or any other type of telephone connection (such as Analog lines etc.). When a subscriber calls into the system, VRU **110** routes the call to the user interface (UI) application that is hosted in an application unit (APU) **120**. APU **120** loads the subscriber data from a persistence storage unit (PSU) **130**, which, for example, can be a directory server, database or a file system comprising a centralized data source.

At some time before recognition is required, APU **120** commands the recognition software that resides in a recognition server (RSU) **125** to load the

personal address book (PAB) and one or more global address books (GAB's) that are relevant to the subscriber. In some implementations APU **120** loads the address books (AB) and passes them to RSU **125** rather than RSU **125** loading them from PSU **130** directly.

The ASR software residing in RSU **125** can recognize the names in the PAB based on two types of "Contact" enrollment:

a. The subscriber adds the name using the telephone system via a training session. The training session includes the following exemplary steps:

- APU **120** commands RSU **125** to start Voice Enrollment;
- the subscriber is asked to speak the name of the new contact;
- after prompting the subscriber (i.e., "enter the contact's name") VRU **110** passes the PCM (voice) data to RSU **125;**
- the ASR in RSU **125** "learns" the voice pattern and also records the original PCM data; it then returns to the application a rating number reflecting the quality of the training;
- based on the quality of the training APU **120** decides whether to undergo another cycle of training; and
- when the training is complete, APU **120**:
  - i. commands RSU **125** to update the PAB data of the subscriber with the new contact information (so that it can be recognized next time); and
  - ii. reads the PCM data from RSU **125** and saves it to the PAB to be used to echo the contact's name for future verification.

Note: the actual saving of data to the PAB in i & ii can be done either by the ASR or the application.

b. Add a name, for example, via WEB insertion of the contact name in text format as described hereinbelow. In this case the name can be saved for recognition in the PAB in one of two ways:

- use the text representation and load it into RSU **125** when

required; and

- partially, or completely, translate the name into a more "favorable" format for RSU **125**, thereby easing the load resource requirement, e.g. less CPU usage and less elapsed time.

At that point, a telephone network-based system session is initiated either by the system or by the subscriber who, for example, can then say "Call John Jones," where John Jones is an entry in one of the GAB's or the PAB.

As further described hereinbelow with reference to Fig. 3, the session continues in accordance with the steps shown in the flowchart.

In some alternative implementations the four logical units described above can be allocated to different physical units. Any combination is possible, e.g. APU **120**, VRU **110** and RSU **125** are on one physical unit and PSU **130** on a separate physical unit.

If VoIP is the type of network connectivity being utilized, the VRU can be placed in the DMZ zone (as in Fig 2)

In accordance with the principles of the present invention, once the telephone network-based system has added "John Jones" as an entry with or without at least one telephone number, the inventive system can access from the Web, for example, additional information associated with this contact and automatically insert this information into the PAB of the user.

ii. WEB access, or any other possible way of inserting textual information, for example using a corporate intranet – is used in this application for updating the PAB or a GAB in PSU **130**, with a work telephone number, for example. The subscriber, seated at his WEB Client browser **70**, which can be a Personal Computer (PC), Wireless Access Protocol (WAP) telephone, Personal Digital Assistant (PDA) or any other such Web-based personal device, logs into the application via the Internet or Intranet **116**. Once the subscriber is logged onto the Web, an application begins to run in a WEB application server **50**. The application enables the user to update the PAB or a GAB via the web page so that the subscriber can use the updated PAB or GAB via the telephone thereafter. The

subscriber usually edits the PAB, and usually someone else that was assigned by the organization edits the GAB, wherein the organization members are included in the GAB.

The white pages device **135**, shown in figures 1 and 2, is a logical device that represents a textual directory unit that can be a source for searching for contact data based on a telephone number. This device can, for example, be one of the following, or any combination of them:

- a directory server of a database server containing a white pages list or a Yellow pages list;
- a Human Resources Database of the organization to which the subscriber belongs;
- a voice mail system list of users; and/or
- a more general search engine function, such as that used by Yahoo that can be located in the internet zone with or without some "Proxy agent" in the DMZ zone.

When a name is added, or edited, via the Web in a text format, it is required to save the ASR data in the more "favorable" text format found by means of the Web, then the Web application Commands the RSU **125** (or, optionally, another unit hosting the ASR engine in the secured or DMZ zone) to "compile" the text name to that format and save it in PSU **130** for loading as described earlier (alternatively the Web application can ask RSU **125** to compile the data and return the "compiled" format, and it is then saved to PSU **130**).

Fig. 2 is the schematic illustration of the telephone network-based system for new contact insertion in a PAB of fig. 1, wherein the "front-end" APU, RSU and VRU functions are distributed over more than one site, in accordance with an exemplary embodiment of the present invention. The system, as shown in Fig 2, can thus, alternatively, be spread over multiple locations. For example, PSU **130**, DMZ **85** and white pages device **135** can be in a centralized location, while there are a plurality of remote sites **87** for example, Washington and New York, each containing a VRU **110**, an APU **120** and an RSU **125**. All sites **87** have internal LAN's **77**, and there is a wide area network (WAN) **73** connecting all sites **87**.

When VoIP connectivity is used the VRU can be located in the DMZ zone so that access from the Internet zone is enabled. In this case the APU and RSU can be located either in the DMZ zone as well or in the secured zone. Site 3, shown in figure

2B illustrates a case where the VRU, APU and RSU are all located in the DMZ.

Fig. 3 is a flow chart of the PAB contact addition process, for a subscriber accessing the system, in accordance with an exemplary embodiment of the present invention.

In block **140**, the subscriber adds a contact to the PAB via the telephone. As part of the addition of the entry, the system records the subscriber pronouncing the name, and the system gets the telephone number of the contact, for example, from the voice of the user also pronouncing the number. APU **120,** which controls the telephony session, searches any external directory that is configured into the system, and uses the entered telephone number in searching for an entry that matches the telephone number. The unit that assists in searching the entry can be for example white pages **135**, or other relevant address book (AB) directory, such as a yellow pages or a corporate directory. In block **142** the system performs a search of the contact in white pages **135** using the telephone number of the contact. In block **144** APU **120** determines if the contact is found in white pages **135**, and if not, the process ends.

After retrieving all entries that are found to match the telephone number (at least one), a capability known in the art, the system **80** operates in accordance with the principles of the present invention, to ascertain that the name found matches the name added in **140**. If more than one entry was returned, then the system attempts to find if one of the names matches the pronounced name. To do so, APU **120** in block **146** gets all names from the external AB, and in block **150** loads them to the ASR recognizer in RSU **125**.

Subsequently, whether either one or more names are found, in block **160** the system plays the recorded contact name to the recognizer as was recorded in block **140**. In block **170** the system determines if the played contact name matches one of the names found in white pages **135**. If no match is found the process ends. If a unique match, with quality above a given threshold is found, then in block **180** the system fills in all data found in White pages **135**, e.g. name, e-mail, address, work telephone number, etc., into the contact entry in PSU **130**. If the process does end, then in block **190** APU **120** can decide to train the ASR to recognize this contact based on the textual name that was added. The text representation (with or without partial compilation) can either be added to the original training, or replace it. In case

the ASR returns a quality that is not above a given threshold, then if this quality applies only to one entry, then the user is asked to approve the addition of that entry. If there are a few names that are returned with this quality the user is asked to choose between them.

In case the session has ended due to no match found, as in block **170**, then depending on the system configuration, the subscriber can be offered a name from the names found.

If the telephony session only entered the name of the new contact, but the telephone number of the contact was added via a search using Web **116**, then the previous algorithm is also executed under the control of Web Application server **50**. In this case RSU **125** can optionally be located in DMZ zone **85**, or can even be hosted in server **50** itself. The answer returned after augmentation is presented on the Web page for this contact. If the ASR is not above the threshold quality, a dialog box for either approving, or choosing between the possible alternatives, is displayed. If no match is found, the list can still be presented, and the user can choose to augment from among the listed names.

It will be appreciated that the preferred embodiments described above are cited by way of example, and that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention, as defined by appended claims, includes both combinations and sub-combinations of the various features described hereinabove, as well as variations and modifications thereof, which would occur to persons skilled in the art upon reading the foregoing description, and which are not disclosed in the prior art.